IUPUI
INDIANA UNIVERSITY–PURDUE UNIVERSITY INDIANAPOLIS
PURDUE SCHOOL OF ENGINEERING & TECHNOLOGY
MECHANICAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING
Purdue School of Engineering and Technology

FALL SEMINAR SERIES

Date: Thursday, November 3, 2005
Time: 11:00 am - noon
Room: SL 165

Everyone is invited

DIFFUSION FLAME SHAPES AND THIN FILAMENT DIAGNOSTICS

Dr. Sivakumar S. Krishnan

Assistant Professor of Mechanical Engineering, IUPUI

Abstract. The safety of future manned missions to the moon and Mars hinges upon a proper understanding of how fires behave in outer space zero gravity/ microgravity environments. Past studies have been limited to low oxygen concentrations and configurations in which the high velocity fuel enters an oxidizing atmosphere. However, one important fire scenario in outer space is a high velocity high oxygen oxidizer jet encountering fuel (an inverse flame configuration). This study focuses on flame shapes of oxygen- enhanced flames in inverse and normal diffusion flame configurations. The objective is to compare results from recent analytical models with experimental data for a number of normal and inverse flame configurations with varying oxygen concentrations to understand the effect of high oxygen concentrations and gravity on flame shapes. Flame shapes are important for fire safety researchers and for flame radiation calculations, which require flame surface area and volume information. The results show that in highly convective inverse diffusion flames gravity has a marginal effect of gravity on flame shape. The effect of buoyant acceleration and thermal gradients in the flame are studied through an extended form of the Roper model. The results are encouraging considering the limitations of the analytical model.

Recent results of visual diagnostics using thin SiC filaments in flames will also be presented.

About the Speaker. Dr. Sivakumar S. Krishnan is currently Assistant Professor of Mechanical Engineering with IUPUI. His teaching and research interests are in the area of thermal fluids Specifically, his research interests include oxygen enhanced combustion, soot formation and emissions, waste heat recovery, cooling systems, thermodynamic analysis, infrared spectroscopy, laser-based optical diagnostics and measurements and sensors